

REMARKS

In response to the Office Action of March 28, 2003, Applicants have amended the claims, which when considered with the following remarks, is deemed to place the present application in condition for allowance. Favorable consideration of all pending claims is respectfully requested. Amendments and/or cancellation of claims have been made in the interest of expediting prosecution of this case. Applicants reserve the right to prosecute the same or similar subject matter in this or another application.

Claims 1-11 and 25-32 are pending in this application. By this Amendment, Claim 1 has been amended, Claims 12-24 have been withdrawn from further consideration as being drawn to a non-elected invention, and new Claims 25-32 have been added. Support for the amendment and new claims can be found throughout the specification, in the working examples and in the original claims. This amendment has been formatted in accordance with the Pre-OG notice set forth in the U.S. Patent and Trademark Office's website (i.e., www.uspto.gov/web/offices/pac/dapp/opla/preognotice/revamdtprac.htm). Applicants respectfully submit that no new matter has been added to this application nor have any new issues been raised by this amendment. Moreover, the claims as now presented are believed to be in condition for allowance and such is respectfully requested.

In the Office Action, the Examiner issued a requirement for restriction under 35 U.S.C. §121 categorizing original Claims 1-24 as follows: Group I made up of Claims 1-11 drawn to a liquid antiozonant mixture; and Group II made up of Claims 12-24 drawn to a rubber composition. A provisional election was made by applicants with traverse to prosecute the invention of Group I. Applicants elect herein, with traverse, the subject matter of the claims of Group I, i.e., Claims 1-11, for examination in this application.

It is respectfully submitted that the requirement for restriction between the claims of Group I and Group II is improper and should be withdrawn.

Restriction is proper only if the claims are either independent or patentability distinct and the search and examination of the entire application would impose a serious burden on the examiner (MPEP §803). Applicants respectfully traverse the Restriction Requirement because the Examiner has not provided sufficient reasons to show that such a burden exists. Here, all of applicants' claims are directed either to a liquid antiozonant mixture (Claims 1-11); to a rubber composition containing the liquid antiozonant mixture (Claims 12-24) or to a process for preparing the liquid antiozonant mixture (new Claims 25-32). Applicants submit that the Examiner, in searching for liquid antiozonant mixtures, would necessarily find art related to liquid antiozonant mixtures (the claims of Group I), rubber compositions containing the liquid antiozonant mixtures (the claims of Group II) and processes for preparing the liquid antiozonant mixtures (new Claims 25-32). Accordingly, applicants respectfully request that the Examiner withdraw the requirement for restriction and rejoin withdrawn Claims 12-24 with elected Claims 1-11.

The Examiner has rejected Claim 2 under 35 U.S.C. §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. While not necessarily agreeing with the basis of this rejection, applicants have amended Claim 1, from which Claim 2 depends, in a manner believed to obviate the rejection of Claim 2. Accordingly, withdrawal of the rejection of Claim 2 under 35 U.S.C. §112, second paragraph, is respectfully requested.

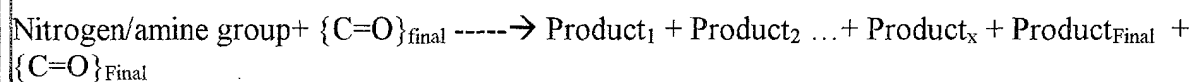
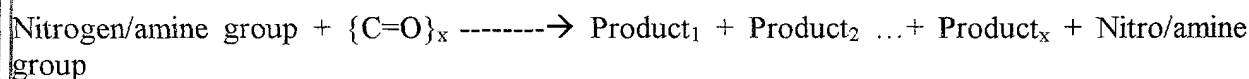
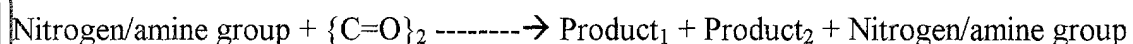
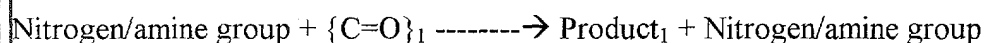
The Examiner has rejected Claims 1-11 under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Merten et al. U.S. Patent No. 4,900,868 ("Merten '868") or Merten et al. EP 084 527 ("Merten '527") or Budd et al. U.S. Patent No. 3,542,691 ("Budd") or D'Sidocky et al. U.S. Patent No. 4,463,191 ("D'Sidocky") or Symon U.S. Patent No. 4,304,939 ("Symon").

Each of these cited references will be hereinafter addressed in turn.

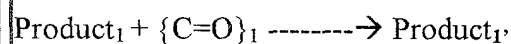
Nowhere does Merten '868 or Merten '527 disclose or suggest a liquid antiozonant mixture obtained from a process comprising simultaneously reacting at least one unsubstituted and/or substituted paraphenylenediamine with a carbonyl compound mixture of acetone and at least one other carbonyl compound selected from ketones containing 4 to about 12 carbon atoms and/or aldehydes containing 1 to about 12 carbon atoms in the presence of a reductive alkylation catalyst as generally recited in amended Claim 1. Nor does Merten '868 or Merten '527 disclose or suggest a process for preparing a liquid antiozonant mixture comprising the step of simultaneously reacting at least one unsubstituted and/or substituted paraphenylenediamine with a carbonyl compound mixture of acetone and at least one other carbonyl compound selected from ketones containing 4 to about 12 carbon atoms and/or aldehydes containing 1 to about 12 carbon atoms in the presence of a reductive alkylation catalyst as generally recited in new Claim 25.

Rather, Merten '868 and Merten '527 both disclose a process for preparing a mixture of two or more different N,N'-disubstituted paraphenylenediamines by the reductive alkylation of a nitrogen-containing compound selected from 4-nitrodiphenylamine, 4-aminodiphenylamine, paranitroaniline and phenylenediamine with two or more ketones wherein the ketones are charged sequentially and each ketone is reacted to completion before charging

the next. As such, one skilled in the art of chemistry would readily understand that the mixture product obtained by the sequential reaction of each ketone to completion as disclosed in Merten '868 and Merten '527 would be different than the claimed mixture product obtained by the simultaneous reaction of all components. The sequential reaction of Merten '868 and Merten '527 adds one specific carbonyl group compound (ketone or aldehyde) to react with the amine group of the nitrogen-containing compound one at a time, i.e., each individual carbonyl group compound is reacted until it is consumed. Only the final carbonyl group compound is added in excess to completely remove the amine by reaction. This can be illustrated as follows:



The sequential reactions are very controlled reactions with only one specific main reaction occurring with one specific reaction rate for each step. However, for all subsequent steps after step one, the introduction of the additional carbonyl group compounds present the opportunity for "over" reductive alkylation of the products. That is, while the main reaction is occurring between the starting nitrogen/amine group compound with the respective carbonyl group compound added, side reactions with completely different rates can occur, i.e., except for the first step, Product₁ can only over react with {C=O}₁ (the first carbonyl compound group) until it is completely consumed, which is illustrated as follows:



During the next carbonyl group compound addition, you get:

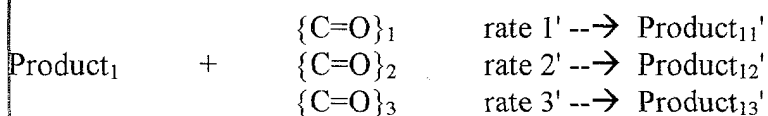
$\text{Product}_1 + \{\text{C=O}\}_2 \text{ -----} \rightarrow \text{Product}_1$ (present in minute quantities from 1 addition)
 Product_{12} (reaction Product_1 w/ 2nd carbonyl group compound)
 Product_2 (Nitro/amine group over reaction in 2nd addition)
 Product_2 (standard product for 2nd addition)

The minute side reactions would continue with each addition. The standard product formed in the steps following the first addition would never be able to react with the first carbonyl group compound, $\{\text{C=O}\}_1$, for it is completely consumed. For example, the standard product formed from the xth carbonyl addition, Product_x , could never react with carbonyl group compounds up to $x\{\text{C=O}\}_{x-1}$. These carbonyl group compounds never exist because as stated "they are completely reacted". However products up to x such as Product_1 to x could react with the xth carbonyl group compound forming similar structural side products but it is not the same reaction, reaction rate, or chemistry. Each of these sequential reactions will have specific reaction rates and will also be dependent on the specific carbonyl group compound in conjunction with the catalyst system used, and conditions.

In contrast thereto, the claimed liquid antiozonant mixture obtained by simultaneous reaction uses the specific differences in the reactions rates established between the various carbonyl group compounds present and the starting nitrogen/amine group compound present. The reaction rates for side products also are vastly differently since all the carbonyl group compounds are present from the start. Each resulting product will have numerous routes and potentials for additional reactions. For example, consider a 3 ketone mixture system. The standard product formation would be as follows:

Nitrogen/Amine group	+	$\{\text{C=O}\}_1$	rate 1 --→	Product_1
		$\{\text{C=O}\}_2$	rate 2 --→	Product_2
		$\{\text{C=O}\}_3$	rate 3 --→	Product_3

The minute side reactions are also occurring during this reaction. For example, the side reactions forming with Product₁ are as follows:



The side reaction for the other major components, Product₂ and Product₃, are also occurring at the same time, not sequentially limited due to the order of the carbonyl group compounds charged as all of the carbonyl group compounds are present, e.g., Product₂ can react with carbonyl group compound 1, {C=O}₁, to make a product Product₂₁. Accordingly, the resulting mixture products obtained by simultaneous reaction cannot be the same as the resulting mixture products obtained by sequential reaction. In lacking any disclosure or suggestion of the presently claimed liquid antiozonant mixture and process for making the liquid antiozonant mixture, amended Claims 1-11 and new Claims 25-32 are believed to be patentable over Merten '868 and Merten '527. Therefore, withdrawal of the rejection is respectfully requested.

With respect to Budd, nowhere does Budd disclose or suggest a liquid antiozonant mixture obtained from the process comprising simultaneously reacting at least one unsubstituted and/or substituted paraphenylene-diamine compound with a carbonyl compound mixture of acetone and at least one other carbonyl compound selected from ketones containing 4 to about 12 carbon atoms and/or aldehydes containing from 1 to about 12 carbon atoms in the presence of a reductive alkylation catalyst as generally recited in amended Claim 1. Nor does Budd disclose or suggest the presently recited process for preparing liquid antiozonant mixtures of Claims 25-32. In fact, the Examiner even acknowledges this on page 8 in the Office Action by stating "Budd et al. discloses a one step process for preparing a liquid N-alkyl-N'-phenyl-paraphenylenediamine mixtures...by reacting a mixture of 4-methyl-2-pentanone, 5-methyl-2-hexanone and at least one

nitrogen containing compound...in the presence of a Group VIII catalyst...". In lacking any disclosure or suggestion of the presently claimed liquid antiozonant mixture obtained from the reaction of at least one paraphenylenediamine compound with acetone and at least one other carbonyl compound selected from ketones containing 4 to about 12 carbon atoms and aldehydes containing from 1 to about 12 carbon atoms in the presence of a reductive alkylation catalyst, Budd cannot possibly anticipate or render obvious amended Claims 1-11 and new Claims 25-32. Accordingly, withdrawal of the rejection is respectfully requested.

With respect to D'Sidocky, nowhere does D'Sidocky disclose or suggest a liquid antiozonant mixture obtained from the process comprising simultaneously reacting at least one unsubstituted and/or substituted paraphenylenediamine compound with a carbonyl compound mixture of acetone and at least one other carbonyl compound selected from ketones containing 4 to about 12 carbon atoms and aldehydes containing 1 to about 12 carbon atoms in the presence of a reductive alkylation catalyst as generally recited in amended Claim 1. Nor does D'Sidocky disclose or suggest the presently recited process for preparing liquid antiozonant mixtures of new Claims 25-32.

Rather, D'Sidocky simply discloses the preparation of N-phenyl-N'-alkyl-p-phenylenediamines. To accomplish this, D'Sidocky further discloses the reductive alkylation of an aromatic nitro-containing compound (none of which are the paraphenylenediamines of the recited formula in Claim 1) with ketones or aldehydes in the presence of a catalyst system consisting of a polymer bound anthranilic acid-Pd complex and a sulfonic resin. Accordingly, D'Sidocky merely discloses the preparation of paraphenylenediamines and not at all to a liquid antiozonant mixture obtained by simultaneously reacting at least one paraphenylenediamine with a carbonyl compound mixture of acetone and at least one other carbonyl compound selected

from ketones containing 4 to about 12 carbon atoms and/or aldehydes containing 1 to 12 carbon atoms in the presence of a reductive alkylation catalyst or to the claimed process for preparing the recited liquid antiozonant mixture.

In the Office Action, the Examiner maintains that Example 7 of D'Sidocky anticipates the present claims. However, Example 7 simply illustrates the preparation of N-phenyl-N'-alkyl-p-phenylenediamine by reacting p-nitrodiphenylamine, methylisobutylketone with a catalyst of (1) styrene/vinylbenzyl chloride/divinylbenzene resins; (2) polymer-bound macromolecular anthranilic acid; (3) macroreticular polymer-bound palladium anthranilic acid complex or (4) macroreticular polymer-bound palladium anthranilic acid complex. There is simply no disclosure in Example 7 of a liquid antiozonant mixture obtained from the simultaneous reaction of at least one paraphenylenediamine with the recited carbonyl compound mixture in the presence of a reductive alkylation catalyst. In lacking any disclosure or suggestion to the specifically claimed liquid antiozonant mixture and process for preparing the mixture, amended Claims 1-11 and new Claims 25-32 are patentable over D'Sidocky. Thus, withdrawal of the rejection is respectfully requested.

With respect to Symon, nowhere does Symon disclose or suggest a liquid antiozonant mixture obtained from the process comprising the simultaneous reaction of at least one unsubstituted and/or substituted paraphenylenediamine with a carbonyl compound mixture of acetone and at least one other carbonyl compound selected from ketones containing 4 to about 12 carbon atoms and/or aldehydes containing 1 to about 12 carbon atoms in the presence of a reductive alkylation catalyst as generally recited in amended Claim 1. Nor does Symon disclose or suggest the presently recited process for preparing liquid antiozonant mixtures of new Claims 25-32.

Rather, Symon, like D'Sidocky, simply discloses the preparation of N-phenyl-N'-alkylphenyldiamines by the reductive alkylation of a nitrogen-containing diphenylamine and a ketone in the presence of hydrogen and a hydrogenation catalyst. The Examiner maintains that the Symon examples disclose the claimed liquid antiozonant mixtures. However, none of the examples disclose or suggest the simultaneous reaction of at least one unsubstituted and/or substituted paraphenylenediamine with a carbonyl compound mixture of acetone and at least one other carbonyl compounds selected from ketones containing 4 to 12 carbon atoms and/or aldehydes containing 1 to about 12 carbon atoms in the presence of a reductive alkylation catalyst as generally recited in amended Claim 1 and new Claim 25. The Examiner is respectfully requested to identify with particularity (i.e., column and line number) which example in Symon the claimed antiozonant mixture is shown. In lacking any disclosure or suggestion of the presently claimed liquid antiozonant mixture and process for preparing the liquid antiozonant mixture, amended Claims 1-11 and new Claims 25-32 are believed to be patentable over Symon. Accordingly, withdrawal of the rejection is respectfully requested.

The Examiner has rejected Claims 1-11 as being obvious over Horst U.S. Patent No. 1,906,935 ("Horst").

As pointed out by the Examiner in the Office Action, nowhere does Horst disclose or suggest a liquid antiozonant mixture obtained from the process comprising simultaneously reacting at least one unsubstituted and/or substituted paraphenylenediamine compound with a carbonyl compound mixture of acetone and at least one other carbonyl compound selected from ketones containing 4 to about 12 carbon atoms and/or aldehydes containing 1 to about 12 carbon atoms in the presence of a reductive alkylation catalyst as generally recited in amended Claim 1.

Nor does Horst disclose or suggest the presently recited process for preparing liquid antiozonant mixtures of new Claims 25-32.

Rather, Horst discloses reaction products of secondary amino compounds and aliphatic ketones and aldehydes in the presence of a catalytic dehydrating agent. Horst further discloses that the catalytic dehydrating agents can be calcium chloride, sulfanilic acid, phosphorous pentoxide, sodium hydroxide, magnesium perchlorate, acetic acid, barium oxide, zinc chloride, and the amine addition product with zinc chloride such as $(C_6H_5NH_2)$, $ZnCl_2$, and sulphuric acid. These catalyst could also be classified as acid catalysts. At no point, however, is there any appreciation in Horst of employing a reductive alkylation catalyst in the simultaneous reaction of at least one unsubstituted and/or substituted paraphenylenediamine compound with a carbonyl compound mixture of acetone and at least one other carbonyl compound selected from ketones and aldehydes to form the claimed liquid antiozonant mixture. Reductive alkylation catalysts and acid catalysts are distinctly different catalysts resulting in different chemical reactions. The Examiner alleges in the Office Action that zinc chloride is a Group VIII catalyst and, as such, is a reductive alkylation catalyst. However, as one skilled in the art of chemistry would readily recognize, zinc is a Group II metal. As such, zinc chloride would not provide the same liquid antiozonant mixture as a reductive alkylation catalyst. If it is the Examiner's position that Horst discloses reductive alkylation catalysts, the Examiner is respectfully requested to identify with particularity (i.e., by column and line number) wherein Horst such teaching can be found.

For the foregoing reasons, amended Claims 1-11 and new Claims 25-32 are believed to be nonobvious, and therefore patentable, over Horst.

For the foregoing reasons, amended Claims 1-11 and new Claims 25-32 as presented herein are believed to be in condition for immediate allowance. Early and favorable action is earnestly solicited.

Respectfully submitted,

A handwritten signature in cursive script, reading "Michael E. Carmen".

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